REMARKS

Claims 1-4, 6-15, and 17-20 were previously pending in the application. Claims 21 and 22 are newly added. Therefore, upon entry of the present Amendment, claims 1-4, 6-15, and 17-22 will remain pending.

Claims 1-4, 6-15, and 17-20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 3,894,572, to Moore, Jr., hereinafter "Moore." Claims 1, 14, and 15 are independent.

Claim 1 recites a method for the production of a shell mould. The method comprises, *inter alia*, forming a coating layer on a pattern, depositing particles of refractory material onto the coating, and drying. During at least one performance of the depositing step, a gel-forming material is also deposited onto the coating layer, such that after contact with the coating layer, moisture is absorbed by the gel-forming material. This causes gelation of the colloidal binder, so reducing the time required for the drying step. The gel-forming material is a super absorbent polymer.

Moore discloses a process for forming a refractory laminate on the surface of a support structure. The process comprises the steps of dipping the structure into a bath of positively charged colloidal particles to form a coating on the surface, and applying the surface to a particulate refractory material containing a chemical setting agent. (Abstract) The coating containing the positively charged colloidal particles is "stuccoed" by a chemical interaction with the refractory material containing the setting agent, so that the sol is coagulated and immobilized. (col. 3, l. 19-22, 54-56)(emphasis added)

In a prior Amendment, Applicant illustrated how the superabsorbent polymers of the present claims have a cross-linked structure that enhances their ability to absorb moisture, and that the compounds listed in Moore lacked this cross-linked structure. Superabsorbent polymers are a particular class of cross-linked polyelectrolytes. They consist of extended, covalently-bonded molecules having a branched and

interconnected structure and multiple hydrophilic groups. As a result of their cross-linked chemical structure, solvent water is trapped within a three-dimensional lattice of the polymer molecule and hence is isolated from the general solvent surroundings.

Since each superabsorbent polymer molecule is covalently-bonded and crosslinked, the strands of the polymer are not able to move apart to release the water, which is therefore 'locked' in position. This is in significant contrast to polymers formed from the same monomers, but which are not crosslinked, and so do not fall within the category of superabsorbent polymers.

Some of the possible candidates for the chemical setting agent of Moore are homopolymers of acrylic acid and methacrylic acid. The Advisory Action states that the cited homopolymers are polyanionic, and "have a cross-linking structure." Applicant respectfully submits that this assertion is incorrect, and has no basis in Moore. Perhaps the Advisory Action is confusing the discussion of the cross-linked sol particles in Moore with the discussion of the setting agent. As further discussed below, any discussion of cross-linking is limited to the sol particles themselves, and there is no disclosure whatsoever of a cross-linked setting agent, as is found in the superabsorbent polymer gel-forming material recited in the present claims.

When the chemical setting agent of Moore is a polyfunctional organic acid, the mechanism by which the setting agent interacts with the colloidal particles is said to be by ionic interaction of the anionic portions of the setting agent acids with the positively-charged sol particles (col. 8, lines 36-39). This creates a network of sol particles held together by molecules of setting agent – referred to in Moore as 'resultant cross-linking and aggregation of colloidal particles' (column 6, lines 39-40). It is important to realize that this 'cross-linking' does not refer to the polyfunctional organic acid molecules themselves, nor does it imply any kind of covalently-bonded network. Rather, it refers to the sol particles being linked by ionic interaction with molecules of setting agent. This mechanism is dependent on the use of a particular type of sol, since the particles must be positively charged in order to interact with the setting agent. There is nothing in this

mechanism which would lead one skilled in the art to believe that gelation could be caused by absorption of water by the gel-forming material, as in the presently-claimed method, without interaction of the gelling agent directly with the sol particles. In fact, the reverse is true. Moore teaches that as regards this mechanism, it is necessary to for the gelling agent to bind directly to the sol particles to produce gelation.

By contrast, the claims of the present application rely upon the gel-forming material simply withdrawing water from the slurry material, and thereby bringing the sol particles together, without any direct modification of the particles themselves. Thus, it can be seen that the mechanism for chemical interaction between the sol particles and the setting agent described in Moore actively leads the skilled man away from the invention of the present application. In particular, Moore teaches of the need to use a particular sol (having positively-charged particles, coated with a polyvalent metal), and to select a setting agent which will interact chemically with the sol to cause the sol particles to form into a chemical network. By contrast, the present claims rely on the use of a particular type of gel-forming material, a superabsorbent polymer, which is able to remove water from the sol and trap the water in a network with the gel-forming agent. In the present application, there is no chemical interaction with the sol particles, which are immobilized purely as a result of the removal of water.

In fact, the use of a crosslinked gel-forming material, such as a superabsorbent polymer, would be in direct contradiction to the aims of Moore. As noted above, Moore uses the anionic groups of a polymeric gelling agent to interact with the positively-charged sol particles, and thereby to form the sol particles into a network. As such, it is important that the anionic groups are available to interact with the sol particles. By contrast, in a crosslinked polymer, many of the anionic groups will be located in the interior of the polymer molecule, where they are still accessible to small solvent molecules such as water, but where they are unavailable to interact with the larger sol particles. The skilled artisan following the teaching of Moore, therefore, and happening to choose a polyfunctional acid as a gelling agent instead of a base or a monofunctional organic acid (despite no particular motivation to do so), would therefore specifically

choose a non-crosslinked polymer in order to ensure that the gelling agent has sufficient flexibility to form the maximum number of interactions with the sol particles. Moore provides no suggestion of forming any sort of network with solvent water, and so there is no reason for the skilled person to even consider the use of superabsorbent polymers.

Finally, the presently claimed invention offers a number of advantages over the system disclosed in Moore. As noted above, Moore is very limited in the choice of sol materials as a result of the need to provide positively charged sol particles with polyvalent metal coatings. By contrast, the presently claimed invention is useful with standard investment casting materials. (See p. 4, final paragraph of the specification.) Secondly, the gel-forming material of the present application is inert with respect to the sol particles. After each application of the gel-forming material (both in the present application and in Moore), the pattern re-dipped into the slurry of sol particles, with the danger of leaching of the gel-forming material from the growing shell mould into the bulk slurry. Because the gelling agents used in Moore react chemically with the sol material, any such leaching will cause reaction in the slurry bath and lead to premature gelation of the sol. By contrast, the gel-forming material of the present invention relies on the removal of water from the sol material in the growing shell mould. Although gel-forming material leaching into the slurry tank would also absorb water, the effect of such absorption would be negligible in the context of the volume present in the slurry tank, and so there would be no danger of premature gelation.

Claim 1 is therefore patentable over Moore under 35 U.S.C. §103(a). Claims 2-4 and 6-13 all depend from claim 1, and are also patentable over Moore for at least the reasons provided above with respect to claim 1.

Claim 14 recites a shell mould producible by a method comprising, *inter alia*, depositing a super absorbent polymer onto a coating layer. As stated above with respect to claim 1, Moore fails to disclose or suggest a super absorbent polymer. Claim 14 is therefore also patentable over Moore under 35 U.S.C. §103(a).

Claim 15 is directed to an unfired precursor to a shell mould for producing a casting. The precursor comprises, *inter alia*, at least one layer comprising a super absorbent polymer. As stated above with respect to claim 1, Moore fails to disclose or suggest a super absorbent polymer. Claim 15 is therefore also patentable over Moore under 35 U.S.C. §103(a), as are claims 17-20, which depend therefrom.

For the reasons discussed above, the rejection of claims 1-4, 6-15, and 17-20 under 35 U.S.C. §103(a) as being unpatentable over Moore has been overcome. Applicants respectfully request that it be reconsidered and withdrawn.

Claims 1-4, 6-15, and 17-20 have been provisionally rejected under co-pending United States Application No. 10/587,425. On April 12, 2009, Applicant filed a terminal disclaimer in the '425 Application, thus rendering this rejection moot. The Advisory Action states that the terminal disclaimer was never filed, but a review of the Public PAIR system shows that the terminal disclaimer filed by Applicant in the '425 Application was in fact received on April 16, 2009 by the USTPO. Therefore, Applicant respectfully requests reconsideration and withdrawal of this rejection.

An indication of the allowability of all pending claims by issuance of a Notice of Allowance is earnestly solicited.

Respectfully submitted,

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